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ABSTRACT

The general hypotheses derived from a series of six experiments in instructional theory were as follows: that the individually optimal reading sequence of juxtaposed, but mutally related, prose text depends on learning goal and pre-knowledge; that adult learners are able to approach this reading sequence through their own decisions; and that learning outcome measures depend on this optimality of the individual decisions. For this study, two types of strategies were investigated, a cautious strategy involving preference of unknown texts in familiar knowledge contexts and a curiosity strategy involving preference of unknown texts in unfamiliar contexts. The experimental variation of the learning goal instructions and the number of assigned texts revealed that adult learners do optimize their decisions, and while they tend to favor the curious strategy, they do make concessions to the cautious strategy. This is done to the extent that the text is demanding, the instructions suggest doing so, and the suggested learning goals are perceived as requiring it. (Author/MAI)

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MEMORANDUM

Nr. 15

OPTIMIZING LEARNING THROUGH STUDENT DECISIONS[1)]

Paper presented to the American Psychological Association 85th Annual Convention, San Francisco, 1977

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Abstract

The general hypotheses of the reported series of six experiments was that (i) the individually optimal reading sequence of juxtaposed but mutually related prose text depends on the learning goal and the pre-knowledge, and (ii) that adult learners are able to approach this reading sequence through their own decisions, and (iii) that the learning outcome measures would depend on this optimality of the individual decisions. Two types of strategies were investigated: a "cautious" strategy (preference of unknown texts in familiar knowledge contexts) and "curiosity" strategy (preference of unknown texts in unfamiliar contexts). The experimental variation of the learning goal instructions and the number of texts allowed to read led to the conclusion, that (i) adult learners are indeed able to optimize their decisions, (ii) that they tend to first favor the curiosity strategy but make concessions to the cautious strategy. They do so to the extend that they find the texts demanding, that the instructions suggest to do so and that the suggested learning goals are perceived as requiring it.

Instructional theory has mostly been founded on some current theory of learning. Thus, the emergence of cognitive psychology has contributed to modify the instructional theory from a output-oriented approach to a more processing-oriented approach. Ready examples are the instructional theory of Aebli (1951) - resting on the psychological theory of Piaget -, as well as the works by Ausubel (1963, 1968) and by Rothkopf (1972).
The concept of mathemagenic behavior holds the student's internal or subjective orientation to be the most powerful determinant of the learning effect. Active orientation in a certain direction means decision, means choice. The S's orientation can be influenced by educational means, as recent research on prose learning and on intentional vs. incidental learning has amply demonstrated. To date little research has been done on the internal process of decision-making in learning.

Another factor in the reorientation of instructional theory was the Aptitude-Treatment Interaction (ATI) research. The ATI model implies that different types of educational treatment may be optimal for different students. Apparently almost any pair of treatments interacts with some personality variable. Thus to systematically use the ATI optimization potential puts a heavy burden of differentiated decision-making on the teacher. And this decision-making requires appropriate diagnostics beforehand. The systematic applicability of the ATI model, however, is being constantly called into question. While some specific ATI effects have repeatedly been demonstrated, most of them have not proved to be reliably replicable. This may be due (a) to the multiplicity of the determining factors, which also interact among themselves in most cases, and (b) to the transformation of these factors as the learning process goes on (Cronbach, 1975; Cronbach and Snow, 1977; Flammer, 1975, 1977, in press). A further reason (c) might be that in everyday educational settings the subjective orientation, in terms of actual interest profiles and subjective interpretation of the learning task, differs largely both interindividually and intraindividually. These, too, interact with treatments!

This evaluation of the ATI approach to instruction adds to the previous observation on the lack of scientific research in the individual process of decision-making on the part of the learner. The research program within which the following experiments were made is concerned with theoretical and experimental work on student's decision-making. This is done with the far-reaching aim of enabling instruction to make better use of the ATI effects through systematic enhancement of and reliance on the individual student's decision-making. So far, the area of decision has been restricted to the sequencing of learning material. The student population consisted of College students.

A first series of experiments was based on Ausubel's meaningful learning concept. The basic assumption was that optimal understanding (and therefore also optimal retention, recall and transfer or inferential performance) was to be expected when newly acquired information had become related to previously possessed knowledge according to all the subjectively possible modes of logical connexion. In other words: we postulated that the recall of meaningful material should be positively related to the multiplicity of connexions between previous and freshly acquired information, and that this correlation would become even clearer in the area of transfer and application of recent knowledge to problem-solving. Given the intention of learning "meaningfully", the condition of multiple connexions was most likely to be met when a large amount of relatable facts was activated and mentally at hand. Moreover, relatability would probably depend on the degree to which "old" knowledge had been structured. According to Ausubel, this structure was supposed to be largely idiosyncratic, i.e. interindividually different due to personal learning histories. It therefore followed that the optimal sequence of new contents should vary from one individual to the next.

The rules according to which the optimal sequence depended on the individual pre-knowledge structure were supposed to be general, i.e. the same for all Ss. It was assumed that it was only the Individual Differences (ID's) in the pre-knowledge (amount and structure) that led to ID's in the optimal sequence. Of course, in order to be researchable, the idiosyncratic structures also had to be conceived of in general terms, and

interindividual variation was only allowed within these limits. This assumption not only enables the psychological researcher to study generalizable dependencies but also opens a perspective to use those - general - rules to train a population of students in making better individual decisions.

The operationalizations of these concepts are given together with the report of the experiments.

EXPERIMENT I[2)]

In the first experiment decision-making, i.e., choice behavior, was investigated as well as learning outcome (Fig. 1).

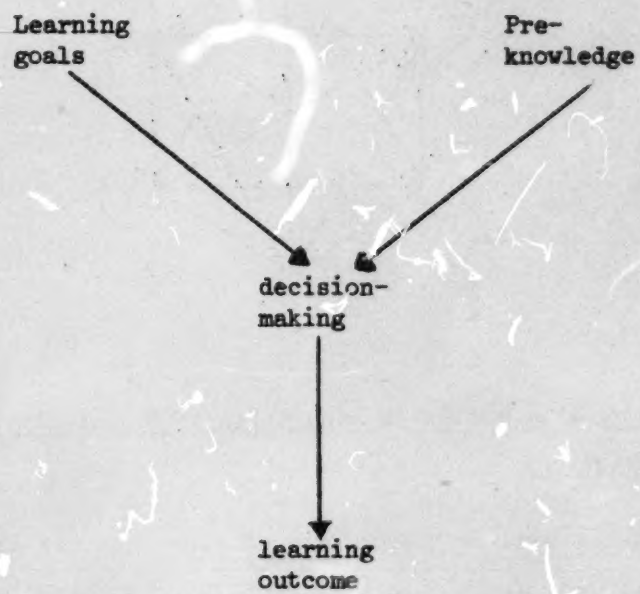

Fig. 1: Dependencies of decision-making and learning outcome

Choice behavior was supposed to depend on both the learning goals and the pre-knowledge. The first study held the goal variable constant by inducing a "plenty of time to learn for transfer" set, while the pre-knowledge variable was allowed to vary "naturally" between the individuals. It was

hypothesized that under these conditions Ss would tend to choose first texts which offered them information which they felt would not be redundant, yet touched on knowledge already familiar to them. It was also hypothesized that this choice strategy would result in higher recall and especially in higher transfer performance.

Method[3)]

Material

Twenty-one texts, half a page long, were produced to meet the requirements of an "elements-and-dual-relations" structure (Fig. 2).

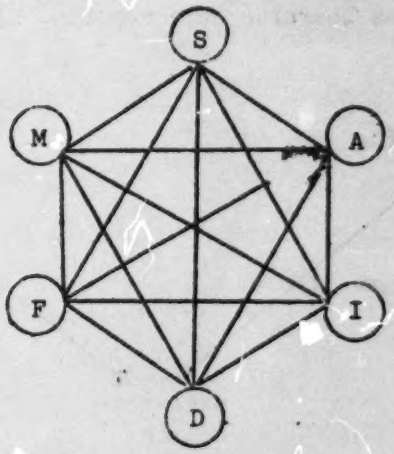

Fig. 2: Formal structure of consisting of 6 elements and $\binom{6}{2}$ dual relations

Under the general heading "Psychology of Learning" six elements were arbitrarily chosen: Signal Learning, Memory, Fear, Development, Intelligence, Animal Behavior. To the six texts corresponding to each of these elements, fifteen texts were added, one for every dual relation (Signal Learning-Memory, Signal Learning-Fear, ..., Intelligence-Animal Behavior). The texts'headings served as cues for the choice alternatives. In order to camouflage the formal structure, they were worded more at length (e.g., "How to define fear? How does it arise?", "Fear in men and animals"). The headings were then listed alphabetically, and the texts arranged in the same order.

This order was maintained when the headings were given in the pre-knowledge or cognitive structure test (CS). Since decision-making was supposed to depend on the individual's estimate of his own knowledge and the text offer, Ss were asked to indicate, on the basis of the titles or headings, which texts had a familiar content and which had not. Thus, the idiosyncratic structure of knowledge was operationalized as a confidence in knowledge profile, mapped onto the general element-relation network.

Post-knowledge was assessed by 42 true/false-items. For each of the 21 texts, one item was either a (reworded) central proposition drawn from the text (true) or a clear contradiction of it (false), and a second item was a proposition which might be legitimately inferred from the text (true) or which was a false deduction from it (false). Thus, the whole test was divisible into a recognition and a transfer part. The items also were arranged in alphabetical order.

Subjects

German-speaking University students preparing a B.A./B.S. in Secondary-Education served as Ss (n=43). During the previous semester they had attended an Introductory course in Educational Psychology.

Procedure

Ss were told that they were to read texts on topics drawn from the field of learning and related subjects. They were given full freedom to choose the sequence in which they would go through the 21 paragraphs. After reading all texts, they were to answer a questionnaire to assess what they had retained and what they were able to infer from it. The experimenter added that he felt that it would be a good strategy to evaluate one's personal progress from time to time (CS test).

Then each S began to work on his own booklet. He went through the initial CS test, chose a text, read it, passed on to the second (identical) CS test, chose another text, perused it, and so on. The pace was set by the experimenter and was the same for all Ss. After twelve such loops, the experimenter, sensing that the Ss were becoming restless (and bored by the repeated CS tests), administered the post-test. (Fewer texts were used in

the following experiments).

The supposed dependency of the (optimal) choice under the given learning goal was operationalized with a familiarity-of-context index (FC). FC was defined as

$$FC_{ii} = \sum_{i=1}^{6} X_{ij} \ (1+X_{jj}) \text{ for elements and}$$

$$FC_{ij} = X_{ii} \sum_{k=1}^{6} X_{ik} + X_{jj} \sum_{k=1}^{6} X_{jk} \text{ for relations.}$$

By these formulae, the context of each element was defined as the five binary relations leading from or to it, together with the second element of each relation (Fig. 3). Conversely, the context of each binary relation was determined by the two elements, each with its remaining four binary relations. FC varied between 0 and 10, both for elements and for relations.

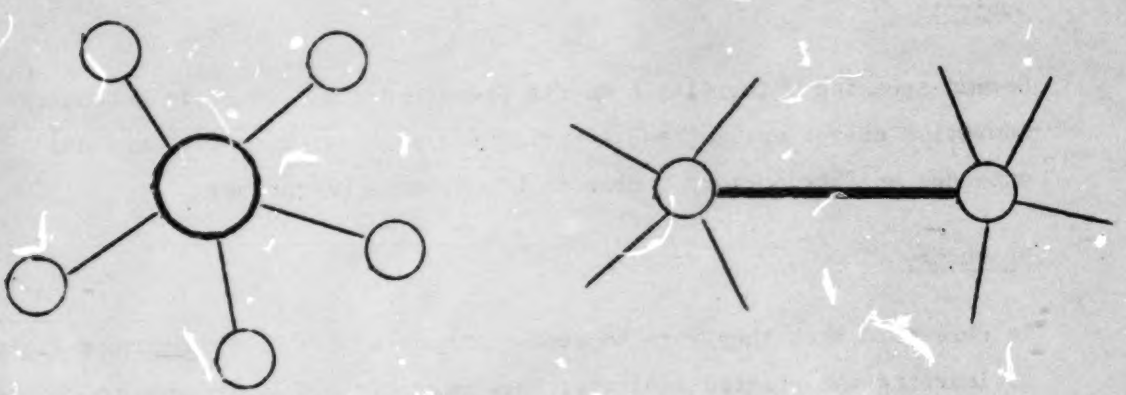

Fig. 3: Contexts, as operationalized by FC

Results and discussion

The first main hypothesis was that, for each choice, the FC's of the chosen texts would be higher than the FC's of the remaining texts. The results showed a significant tendency in this direction: 669 choices went in the direction predicted by the model and 246 in the opposite direction ($p < .01$).

The second main hypothesis was that recognition and, even more, transfer should be positively related to FC, i.e. to the goodness of fit. Several correlation coefficients were calculated (i.e., for each text and for all texts together, with recognition and with transfer). They did not reach statistical significance. Yet, it was noticed that the overall correlations with recognition rose significantly over the twelve choice situations. It is not clear whether the Ss who improved their choice behavior got more out of the texts for this reason, or whether the more knowledgeable Ss were the ones who improved more readily their choice behavior, in which case their achievement may have been independent of their choice strategy.

EXPERIMENT II

The first experiment showed that the proposed conceptualization and operationalization can predict some of the choice variance, but not the results in terms of learning. The second experiment (note 1) was a modified version of the first one. Some methodological changes were introduced to make the results more palpable.

Method

Basically, the method was the same as in the first experiment. The following points were changed: One of the six basic elements ("Development") was deleted with all the dual relations pertaining to it. In this way, the number of texts was reduced to 15. The paragraphs were partly altered and their comparability controlled by a content-analysis procedure (key-concept counting). The titles were reformulated several times, and one for each text was chosen after an expert rating. In order to bring the titles in even closer accordance with contents of the texts, each one was followed by the three most frequent key-concepts. The performance test of the first experiment was subjected to an item analysis, on the basis of which three new parallel texts were written with a recognition item and a transfer item for each of the 15 texts. The first became a pretest, the second an immediate posttest and the third a delayed posttest,

administered after a two weeks interval. The test allocation was effectuated in a latin square type design. Ss were 33 University freshmen in Psychology and Education and 32 College Students (11th grade).

Results and discussion

All in all, the University students' choice behavior fitted the model 134 times, against 87 counterfits ($p < .01$); the same held true for the second group (172 to 126; $p = .01$).

The correlations between the goodness of fit of the choice strategy and the results of the learning tests were insignificant for the immediate posttest in both groups and for the delayed posttest in the College group. Unfortunately, the number of University Ss dropped from 33 to 23 for the delayed posttests. Their correlations were .50 for delayed recognition ($p < .01$), .19 for delayed transfer (n.s.) and .36 for the combined delayed test ($p < .10$). The results of these older students suggest that the predicted and adopted choice strategy pays off, at least in the long run, and provided the Ss have already acquired a certain amount of experience in independent study.

In the College group experiment there was a negative correlation between the goodness of fit of the choices and the pretest. This result might be due to a lack of experience in autonomous text-learning. Perhaps all Ss' first reaction was to choose the most novel passages, and this primary tendency was gradually overcome by a more accurate interpretation of the learning situation. If it is true that younger and less experienced subjects are less able to resist a curiosity predominance, the choice strategy of the second group becomes understandable: they simply gave in to their curiosity. The negative correlation with the pretests would then suggest that the Ss with more pre-knowledge were nevertheless able to choose as the older students do.

To summarize, the choice model again proved of some usefulness. But it remains difficult to ascertain why it was barely related to the learning outcome. Do the experimenters and the Ss share the same illusions concerning the effectiveness of what they call an optimal choice-strategy?

The most parsimonious explanation of the lack of higher correlations seemed to be that, although a significant part of the choice variance was predictable, this variance was not accentuated enough. Slight deviations from a random choice may not have been sufficient to influence the learning results in the desired direction. In order to push the strategy adoption, more experiments were undertaken.

EXPERIMENT III

In experiment III (note 2), the only variation in the design used so far was to have Ss read an Advance Organizer in the sense of Ausubel (1968).

Method

On the methodological level, the third experiment differed from the second in the following respects: 29 out of 57 Ss first read a two-page text on the definition of learning and types of theories of learning, the remaining 28 Ss read an irrelevant control text instead. As an intended University student group was finally not available, the experiment was carried out with Teachers' College students (grades 12, 13, 14). The recognition and transfer tests were reanalysed and revised once more.

Results and discussion

The model did not predict the choice-strategy of either group. The correlations between the goodness of fit and the learning achievement were erratic, and only reached significance on occasion.

Perhaps the Advance Organizer text "disturbed" the Ss and introduced structure-independent preferences. It was also suspected that the Advance Organizer led to ceiling effects either in title familiarity or in the test performance, thus reducing the variances and with this the reliability. But several checks ruled this possibility out. Since the results of the control group were also unpredictable, the burden should probably taken away from the Advance Organizer. It may be, as indicated by the outcome correlations in the second experiment, that younger students, used to a somewhat autocratic College education style,

are clearly less able to manage their own learning than the University students who, although not much older, have to adapt a largely autonomous study style.

EXPERIMENT IV

The fourth experiment (note 3) contributed two new elements: a new operationalization of the structural dependence of the choice behavior and a different outcome measurement. Notwithstanding, the main hypotheses remained the same.

Method

The 15 prose texts used in this experiment dealt with Australian aborigines instead of the Psychology of Learning. The five "elements" were: totem, mythical heroes, sympathetic ceremonies, initiation rites, collective tribal life. Again, half-page texts were written for each of the five elements and each of the ten dual relations, and their structure-fit was checked with a content-analytical method (key-word counting). The titles were either the element word or the two belonging to the relation text (e.g. "totem", "totem-collective tribal life"), without any attempt at camouflaging the formal structure. The Ss were first required to read the five element texts, and only then received permission to choose freely among the ten relation texts. Before each choice Ss had to characterize each element by writing down in the order of their presumed importance eight key-words out of a pool of 14. These word-series were used to calculate a Relatedness Coefficient (RC) in the sense of Garskoff and Houston (1963) for each pair of elements. Thus the main hypothesis, that under given goal instructions a S would prefer unknown texts in a relatively well known context, was operationalized as the prediction that each S would choose amond the unread texts the one that corresponded to the highest RC. This same set of RC's was used to determine the difference between the S's semantic structure and a specially investigated expert structure, using the Euclidean Distance measure (ED). This method was adapted from Shavelson (1972). Distance measures replaced ordinary outcome tests in this experiment. The Ss were 52 College students (grades 12 and 13)

Results

In analogy to the former experiments, a text choice was scored as confirming the model if among the remaining possibilities there were less with higher RC's, than with lower RC's. There were 194 choices in the predicted direction against 109 contradictory ones ($p < .01$). For the third time, results confirmed the choice hypothesis, in this case with an alternative operationalization. And this with College students.

The relation between goodness of fit and learning outcome (i.e., ED's of the Ss' semantic structures from the expert structure) was not straightforward. Ss who did not adapt their strategy had markedly, but not significantly, higher EDs (= more distance or difference) than those who did in terms of choice-strategy. A special data processing showed that one college class, which had apparently collaborated very willingly in the experiment, had made well-adapted choices ($p < .01$), but it had obtained a slightly negative correlation with the learning measures. A second group, somewhat more lackadaisical, adapted poorly, but obtained a correlation in the predicted direction (F test, $p < .10$). It may be that in the given circumstances, the dependence of learning achievement on well-adapted choices corresponds to an inverted U-curve. The absolute values of the ED's of both groups fitted with this U-curve interpretation.

Sticking too close to the model might eventually lead to an insufficient intake of information. The Ss who try to acquire as much information as they can integrate with their pre-knowledge do not follow the model's prediction beyond a certain point in order to keep an element of challenge, but they do make some concessions to it in order to be able to assimilate the new facts. This would mean that the strategy of this model is in a way a "cautious strategy" that competes with a "curiosity strategy", analogous to Berlyne (1960). The weight attributed by competent autonomous learners to both components may depend on the learning goal and the perceived difficulty of the texts. The latter would be supposed to covary inversely with the experience or age of the S. In order to check into this enlarged conceptualization, two experiments were performed with a variation in the goal variable, while the difficulty variable remained "constant", i.e. was kept as it was in experiments I through IV.

EXPERIMENT V

The fifth experiment (note 4) differed from those that preceded in that another independent variable was introduced, as well as another dependent variable. A second group had the learning goal, i.e. the instruction, to gain an overall view of the material by reading a few freely chosen texts. The new dependent variable consisted of the differentiation between intentional and incidental learning.

Method

Prose texts and performance tests were the same as in Experiment IV. Since the reading was interrupted after the fifth text, the intentional learning test was defined for each individual by the items belonging to the texts which he had personally chosen. The remaining items were treated as incidental learning test items.

Again, Ss were Teachers' College Students (grades 12, 13, 14). Two groups were defined by the independent variable "goal". Group 1 (n=40) received the same instructions as the Ss in the foregoing experiments (transfer set). In addition to this, group 1 Ss were told they would have plenty of time to read all the material and that it would probably be good for them to try to establish connections with what they had already learned in terms of psychology of learning. The Ss of group 2 (n=40) were told to memorize what they read as accurately as possible (no transfer set). They would be allowed to read only five of the 15 texts, but to do that they would be given enough time. Finally, the experimenter hinted that it would probably be wise for them to take stock of what they already knew of the psychology of learning by reading those texts that would probably add most new information for them. As a matter of fact, group 1, as group 2, was given the immediate posttest after it had read the fifth text, while the delayed posttest was administered six weeks later.

The first main hypothesis was that group 1 would be led to choose as predicted in the foregoing experiments ("cautious" strategy), but that group 2 would be encouraged to make curiosity decisions ("curiosity strategy"). The curiosity strategy was operationalized by the preference of low FC's, i.e.

the preference for the most novel texts (with unfamiliar content and setting). The results turned out as expected for group 1 (t; $p < .05$). Their FC's were significantly higher than those of group 2, but group 2 also showed a slight, though not significant, tendency towards the cautious strategy. The first choice of group 2 was a curiosity choice ($p > .05$); thus, it is possible that the Ss having discovered that the texts were too difficult for the curiosity strategy, fell back on the cautious approach.

With regard to the learning outcome, it was expected that group 1 would excel group 2 in transfer, in incidental learning and generally in the delayed posttest, while group 2 should be superior in the intentional recognition items. The only significant differences were in favor of group 2: for recognition-incidental immediate posttests, transfer-intentional delayed posttests and transfer-incidental delayed posttests.

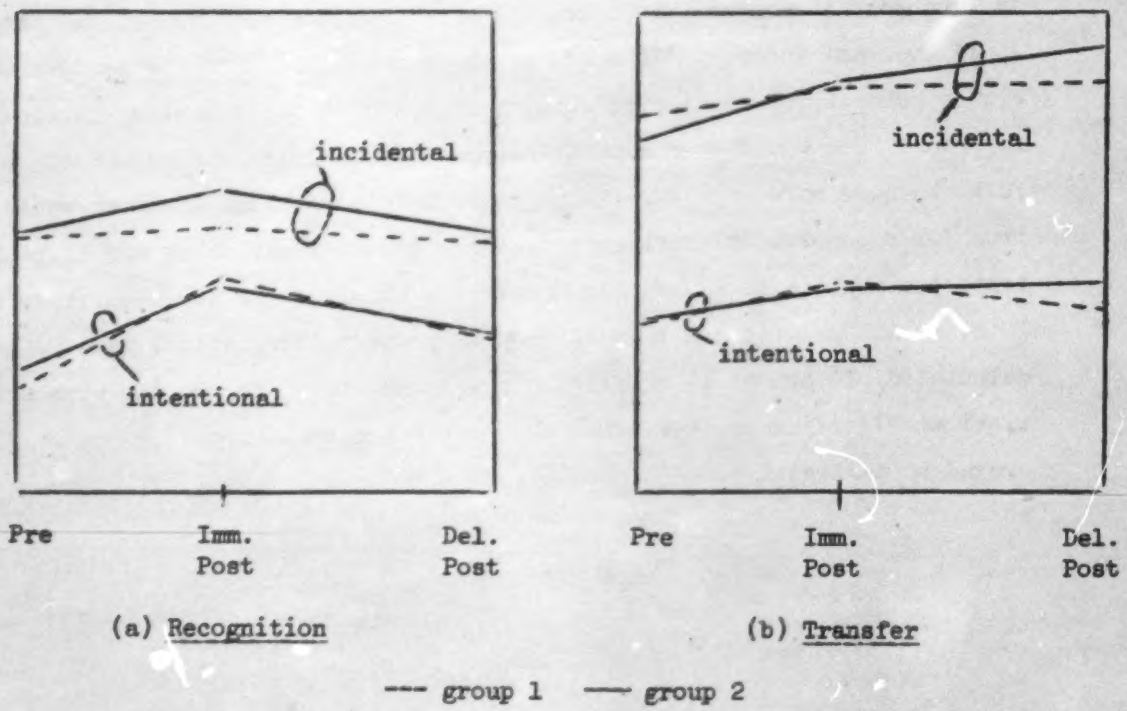

Fig. 4: Intentional vs. incidental learning for (a) recognition and (b) transfer

None of the correlations between goodness of fit and learning outcome was significant, in fact they were mostly negative. In order to test the inverted U-curve hypothesis, separate correlations were calculated for the "well-adapted" subgroups as well as the "ill-adapted" ones. The well-adapted Ss of group 2 produced, as expected, a significantly negative correlation with the immediate transfer test, $r = -.41$ (and also with the transfer pretest, $r = -.43$). Among the ill-adapted Ss, it was group 1 that produced a significant, but also negative, correlation with the delayed transfer test. According to the U-curve hypothesis this correlation should have been positive.

Thus, the correlations did not yield a clear picture. A post-hoc-hypothesis was that Ss primarily tried to follow a strategy that would give them as much information as they could manage, and that the learning goal and the learning conditions (number of texts allowed to be read) only oriented this general strategy either toward the "cautious" pole (high FC's) or the "curiosity" pole (low FC's). If each S was able shift his strategy in a more or less perfect manner, the correlation between the achievement and the FC would lose all interest. It would be the correlation with the pretest or with a general information processing capacity variable that would become important. One would then expect the pretests to correlate negatively with FC's, because more knowledgeble Ss could take more risk. The same would hold true for a general information processing capacity variable; and if posttests can replace this variable, posttests should correlate negatively with FC's. In the experiments II, III, and V, pretest correlations have been calculated. 10 out of 14 coefficients were negative, though not with statistical significance. Reviewing the posttest correlations, 14 out of 28 proved to be negative.

EXPERIMENT VI

To summarize the results and their interpretation at this point, it seems that (adult) learners try to arrange their learning condition with a view to obtaining a subjective maximum of information, and that this maximum would be directly related to the amount of pre-knowledge as well as the individual information processing capacity and inversely related to the perceived difficulty or the informational density of the texts. Apparently, objectively given learning conditions are able to influence what a S feels his optimum would be. Thus, in the experiments I through IV and in the group 1 of experiment V, Ss seemed to interpret the learning goal given by the experimenter as a hint to adopt a more cautious strategy (high FC's). The possibility of influencing this strategy was investigated in a last experiment (note 5) in which the learning goal and the presumed learning time were varied independently.

Method

Material

Eight one page long texts on Australian Aborigines were constructed and given appropriate titles. Instead of the usual CS-test Ss were requested to answer 32 questions on Australian Aborigines and, after each answer, to rate how confident they felt about their statement. For each text there were four test items; but the Ss were not told which text which question belonged to which text.

Subjects and independent variables

64 University students in Social Sciences were randomly assigned to four groups of equal size. The Ss of group 1 were informed that they would be allowed plenty of time to read all texts and that afterwards they would be asked to answer questions concerning the eight texts. Group 2 was allotted the same learning time, but was told that everyone would have to write a one-page essay on Australian Aborigines at the end of the session. Group 3 was warned that their reading would probably be interrupted before all eight texts could be read - depending on factors inherent to other

groups - but that they would then have to answer a questionnaire on all eight texts. Finally, group 4 had the same presumed interruption indication and the goal was to write down a page on the Australian Aborigines (Fig. 5).

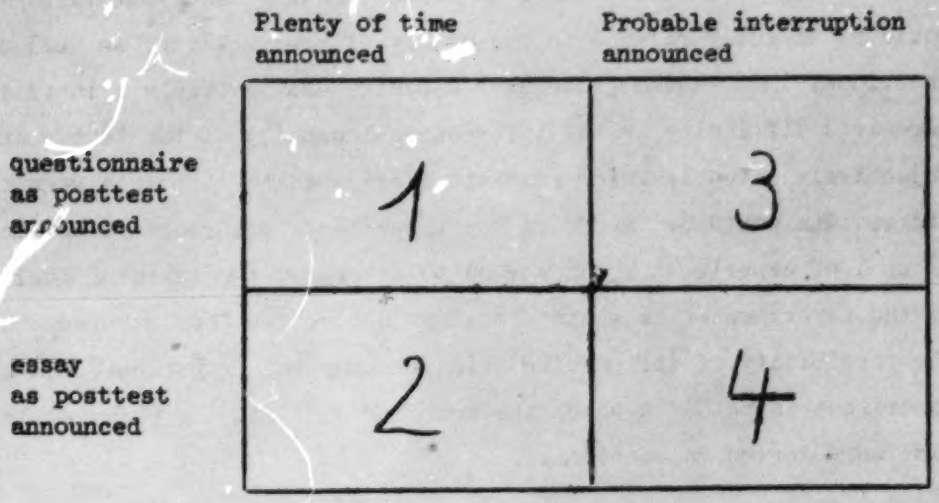

Fig. 5: Experimental groups

Procedure

All Ss read the eight texts. First they did the confidence rating, then chose and read two texts, one after the other, repeated the confidence test, then perused three more texts, answered the last confidence test and acquainted themselves with the three remaining texts.

Results and discussion

The only dependent variable investigated in this study was whether or not Ss primarily chose texts pertaining to subjects in which they felt unsure of themselves (below median average confidence). The low confidence strategy was adopted by the "plenty of time"-groups (1 and 2); the difference between groups 1 + 2 and 3 + 4 was statistically significant.

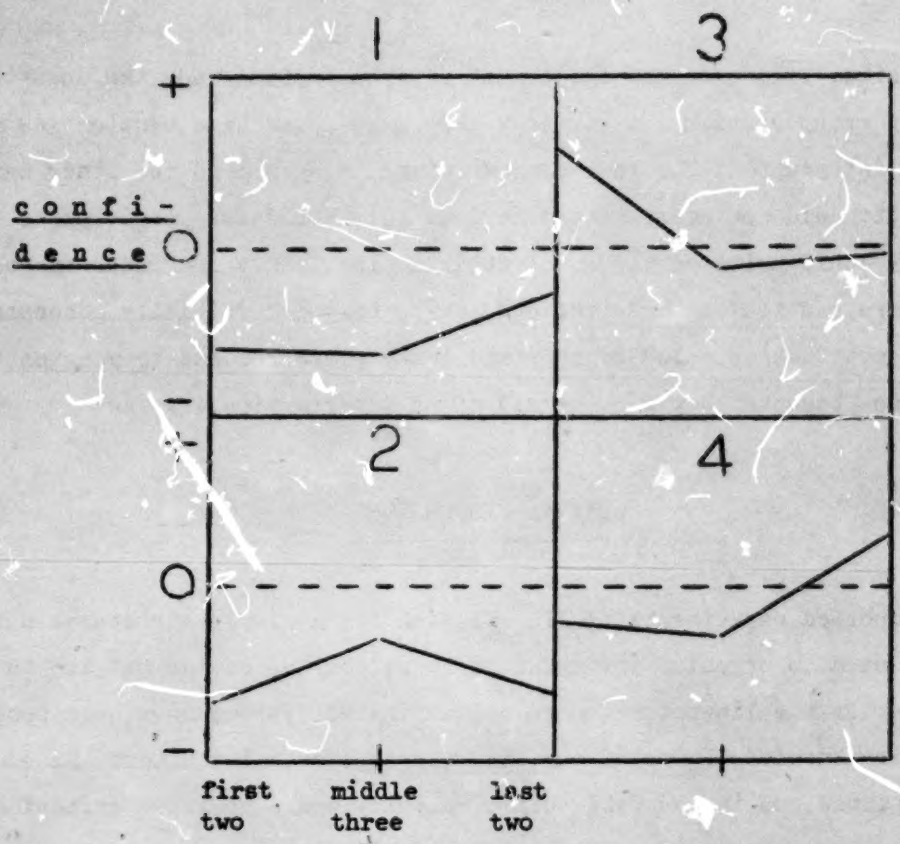

Fig. 6: Preferences for texts with high vs. low confidence in pre-knowledge

The interpretation was that these Ss could afford to take some risk, because the complete coverage of the material might help to understand points which, at first glance, were obscure. That this curiosity strategy involved running certain risks might be partly confirmed by the fact that there was a positive, if not significant, correlation between preference for unfamiliar texts (low confidence concerning the answer) and the number of correct answers in the pretest, for both groups 1 and 2.

The goal variable, question answering vs. essay writing, did not yield a significant simple effect. It had been hypothesized that the text-writing goal would allow the Ss to follow their curiosity because they could finally restrict themselves to write on a few selected points. Detailed inspection showed that while the groups 1 and 2 followed the low-confidence strategy throughout, group 3 started off with the high-confidence strategy and then switched to the low-confidence strategy, while group 4 did exactly

the opposite. It seems that the threat of interruption made the question-answering group cautious, a strategy they gave up as time went on and they were not interrupted. For the essay-writing group on the other hand, interruption did not constitute a serious threat because participants knew that they could write on topics of their choice. It is not clear why they became more cautious towards the end. Maybe they had initially concentrated on a subject that appealed to them and later preferred not to move on to new topics because they were afraid of an interruption anytime.

GENERAL DISCUSSION

In the reported experiments I, II, III, and IV, a simple structural network has been used to organize the prose texts as well as to map out the Ss' knowledge. In the literature, more sophisticated systems have been proposed to describe knowledge. One of our aims was applicability within the educational field, so it was felt that simplicity was a decisive criterion as well as the capacity for handling large elements such as complex prose paragraphs. So far, it does seem that the chosen descriptive system captures an important aspect of the subjective handling of knowledge.

The idea that adult learners might be able to optimize the sequence of learning material individually used to be considered as somewhat optimistic. And the way the reported experiments tried to elucidate this optimizing capacity was fastidious. Failure to prove that the choices followed the predicted pattern, and that the learning outcome was correlated to the goodness of fit may be traceable to quite a variety of pitfalls: Ss' incapacity, inadequate theory about the dependency of the optimal choice on pre-knowledge, or inadequate description of (pre-) knowledge. It seems, all things considered, that the second pitfall was the most serious. A strong Ausubelian view had led to the idea, that, under given learning goals, the higher the familiarity of the context (FC) the greater the pay-off of the information intake. Therefore linear correlations between FC and learning outcome were calculated. As it slowly became apparent that Ss often were too curious and therefore did not follow this strategy, it also became clear that the Ausubelian way, as we had interpreted it,

was not the optimal one in receptive learning. The S's choice behavior, within the given structure description network, called for a different theory concerning the possible optimal strategies, a kind of a combination between the views of Berlyne and Ausubel. Further experiments will have to study in detail how far different goals, varying degrees of difficulty within the texts and personality traits determine optimal dependency and the learner's capacity to optimize his sequence. Indeed, it is expected that this optimization, though gradually attainable by a portion of the learners, would not be accessible to all, except by specific training. And in order to devise accurate training programs, our experiments not merely check whether Ss can make optimal choices, but how those who are apparently successful make up their minds.

Footnotes

1) The research reported herein was supported by the Swiss National Science Foundation grant no. 1.181-0.75.

2) This experiment was published in German (Flammer et al., 1976); the re-report of a part of it facilitates the understanding of the following research.

3) The experimental series reported herein included the study of several other hypotheses. Since this description restricts itself to a small selection of hypotheses it very often has to omit additional S groups, measures, etc.

Notes

Note 1: Gutmann, W. Wissensstruktur und Informationsbedürfnis II. Memorandum Nr. 8. Universität Fribourg, 1976.

Note 2: Neuhaus, H. Organisationshilfen und ihr Einfluss auf selbstgesteuertes Lernen. Lizentiatsarbeit. Universität Fribourg, 1977.

Note 3: Businger, K. Aspekte sinnvollen rezeptiven Lernens im schülergesteuerten Unterricht. Diplomarbeit. Universität Fribourg, 1977.

Note 4: Baeriswyl, F. Der Einfluss von Instruktionen auf die Selbststeuerung beim Lernen. Lizentiatsarbeit. Universität Fribourg, 1977.

Note 5: Egli, H. Determinanten des Informationssuchverhaltens in einer Lernsituation mit Prosatexten. Diplomarbeit. Universität Genf, 1977.

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Nr. 2 Eine Taxonomie der Ceiling-Effekte.
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(publiziert in: Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie 1974, 6, 207-223)
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Nr. 3 Wissensstruktur und Wahl von Informationstexten.
Summary: The Structure of Knowledge and the Search for Information.
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(publiziert in: Zeitschrift für experimentelle und angewandte Psychologie 1976, 23, 30-44)
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